Hydrology and
Earth System
Sciences
Discussions

Interactive comment on "Natural stochasticity vs. management effort: use of year-to-year variance for disentangling significance of two mutually confounding factors affecting water quality of a Norwegian cold dimictic lake" *by* A. T. Romarheim et al.

Anonymous Referee #1

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General comments This study addresses an interesting and relevant topic, namely the influence of meteorological forcing and anthropogenic activities (management) on the water quality of a Norwegian lake. While the methodology development is based on a case-study, the authors argue that their methods and findings are, in general, relevant for systems where "natural stochasticity can affect the target environment". The manuscript text is generally well written, and the presentation of tables and figures

are generally understandable.

My main concerns are; firstly, while meteorological forcing and external nutrient load may exhibit somewhat stochastic behavior, they are indeed linked (as the authors also acknowledge in the discussion). One could therefore argue, that a methodology (such as that developed in the study) that attempts to discriminate between effects of weather and nutrient runoff is irrelevant, as there is a natural covariance between, for example, precipitation and nutrient runoff (which is time-scale dependent). Also, should the manuscript be relevant for the broader audience of HESS, I would also have liked to see more in-depth reflections on how the methodology would be relevant for - and transferred to - other systems. Secondly, the results of using the methodology on a Norwegian case-study lake mainly repeats well established scientific understanding. Examples from the abstract are: "Thermal related properties in the lake were mostly determined by weather conditions" and "loading was the most important factor for phytoplankton biomass".

Specific comments The case study itself is somewhat difficult to follow. One of the key data inputs of the study is external nutrient load to the lake. This has been estimated from a combination of flow and nutrient scaling factors for some subcatchments and an additional lake model application for the largest subcatchment (as this particular area contains a lake that drains into the authors' case study lake). Presumably, the year-to-year variations in nutrient loads (which are used for analysis) therefore also rely on these estimates, and therefore it would have been appropriate to illustrate how well the estimated external nutrient load matches that of the actual nutrient load (and particularly how well the estimates matches year-to-year variations). Also, in the results section, the authors reflect on how variations in external nutrient load and weather (air temperature and precipitation) influence inter-annual variations in water quality attributes such as phosphorus levels and phytoplankton biomass as predicted by the lake model (MyLake). However, the conceptual lake model may not be an appropriate basis for such evaluation, as this, for example, do not discriminate between properties of

phytoplankton that are typical of Spring and Summer periods, respectively. At least this is the impression that I get when reading the description of the model (and the paper by Saloranta and Andersen 2007 that is used as a reference).

Technical corrections There are a few typos, listed below. P124496 L23: achived should be achieved P124496 L24: imporantce should be importance P124496 L25: metrological should be meteorological P124497 L1: albal should algal (?) Figure 3: it would perhaps be more relevant to plot the relative standard deviation (in %) of the variables (rather than the absolute standard devitation), as this would make it easier to compare between variables. Figure 4: I had a difficult time understanding the content of this figure. The colors of the bands demonstrated in the figure are not referred to in the figure caption.